

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7S14F, TC7S14FU

SCHMITT INVERTER

The TC7S14 is a high speed C²MOS SCHMITT INVERTER fabricated with silicon gate C²MOS technology. It achieves a high speed operation similar to equivalent LSTTL while maintaining the C²MOS low power dissipation.

Pin Configuration and function are the same as the TC7SU04F but input have 25% V_{CC} hysteresis and with its schmitt trigger function, the TC7S14F can be used as line receivers which will receive slow input signal.

Input is equipped with protection circuits against static discharge or transient excess voltage.

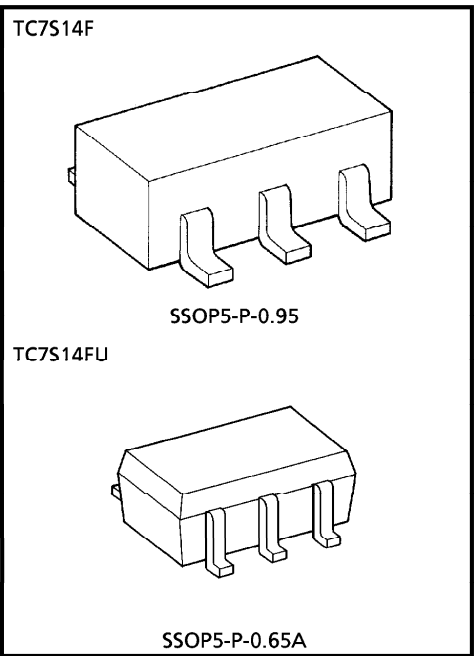
Output currents are 1/2 compared to TC74HC series models.

FEATURES

- High Speed $t_{pd} = 11\text{ns}$ (Typ.) at $V_{CC} = 5\text{V}$
- Low Power Dissipation $I_{CC} = 1\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- High Noise Immunity $V_H = 1.1\text{V}$ at $V_{CC} = 5\text{V}$
- Output Drive Capability 5 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL} = 2\text{mA}$
- Balanced Propagation Delays $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range ... $V_{CC}(\text{opr}) = 2 \sim 6\text{V}$

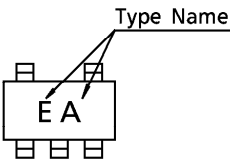
MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7$	V
DC Input Voltage	V_{IN}	$-0.5 \sim V_{CC} + 0.5$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim V_{CC} + 0.5$	V
Input Diode Current	I_{IK}	± 20	mA
Output Diode Current	I_{OK}	± 20	mA
DC Output Current	I_{OUT}	± 12.5	mA
DC V_{CC} / Ground Current	I_{CC}	± 50	mA
Power Dissipation	P_D	200	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	$^\circ\text{C}$
Lead Temperature (10s)	T_L	260	$^\circ\text{C}$



Weight SSOP5-P-0.95 : 0.016g (Typ.)
SSOP5-P-0.65A : 0.006g (Typ.)

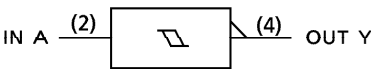
MARKING



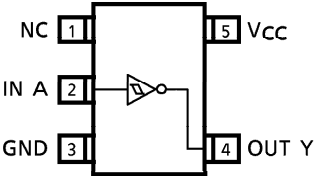
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LOGIC DIAGRAM



PIN ASSIGNMENT (TOP VIEW)



TRUTH TABLE

A	Y
L	H
H	L

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V _{CC}	2~6	V
Input Voltage	V _{IN}	0~V _{CC}	V
Output Voltage	V _{OUT}	0~V _{CC}	V
Operating Temperature	T _{opr}	- 40~85	°C

DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION	Ta = 25°C				Ta = - 40~85°C		UNIT
			V _{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
Positive Threshold Voltage	V _p	—	2.0	1.0	1.25	1.5	1.0	1.5	V
			4.5	2.3	2.7	3.15	2.3	3.15	
			6.0	3.0	3.5	4.2	3.0	4.2	
Negative Threshold Voltage	V _N	—	2.0	0.3	0.65	0.9	0.3	0.9	V
			4.5	1.13	1.6	2.0	1.13	2.0	
			6.0	1.5	2.3	2.6	1.5	2.6	
Hysteresis Voltage	V _H	—	2.0	0.3	0.6	1.0	0.3	1.0	V
			4.5	0.6	1.1	1.4	0.6	1.4	
			6.0	0.8	1.2	1.7	0.8	1.7	
High-Level Output Voltage	V _{OH}	V _{IN} = V _{IL}	I _{OH} = - 20μA	2.0	1.9	2.0	—	1.9	V
				4.5	4.4	4.5	—	4.4	
				6.0	5.9	6.0	—	5.9	
			I _{OH} = - 2mA I _{OH} = - 2.6mA	4.5 6.0	4.18 5.68	4.31 5.80	— —	4.13 5.63	
Low-Level Output Voltage	V _{OL}	V _{IN} = V _{IH}	I _{OL} = 20μA	2.0	—	0.0	0.1	—	V
				4.5	—	0.0	0.1	—	
				6.0	—	0.0	0.1	—	
			I _{OL} = 2mA I _{OL} = 2.6mA	4.5 6.0	— —	0.17 0.18	0.26 0.26	— —	
Input Leakage Current	I _{IN}	V _{IN} = V _{CC} or GND	6.0	—	—	± 0.1	—	± 1.0	μA
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND	6.0	—	—	1.0	—	10.0	μA

Output currents are 1/2 compared to TC74HC series models.

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AC ELECTRICAL CHARACTERISTICS ($C_L = 15\text{pF}$, $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	$T_a = 25^\circ\text{C}$			UNIT
			MIN.	TYP.	MAX.	
Output Transition Time	t_{TLH} t_{THL}	—	—	4	8	ns
Propagation Delay Time	t_{pLH} t_{pHL}	—	—	11	21	

AC ELECTRICAL CHARACTERISTICS ($C_L = 50\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	V _{CC}	Ta = 25°C			Ta = - 40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t _{TLH} t _{THL}	—	2.0	—	50	125	—	145	ns
			4.5	—	14	25	—	30	
			6.0	—	12	21	—	24	
Propagation Delay Time	t _{pLH} t _{pHL}	—	2.0	—	48	100	—	235	
			4.5	—	12	20	—	48	
			6.0	—	9	17	—	40	
Input Capacitance	C _{IN}	—	—	5	10	—	10	pF	
Power Dissipation Capacitance	C _{PD}	Note (1)	—	28	—	—	—		

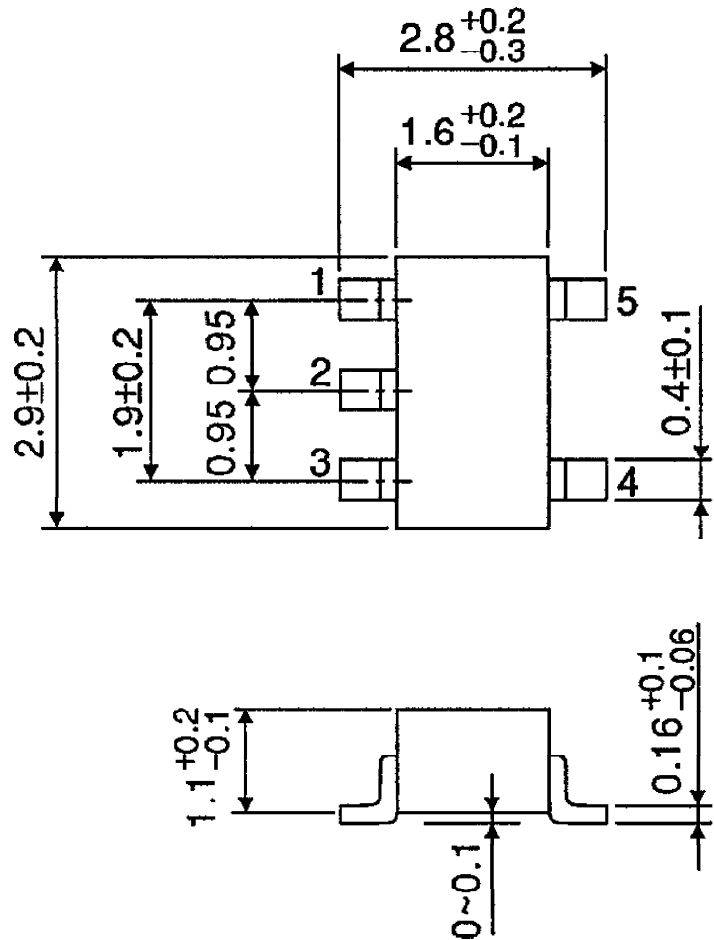
Note (1) : C_{PD} is defined as the value of internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

OUTLINE DRAWING
SSOP5-P-0.95

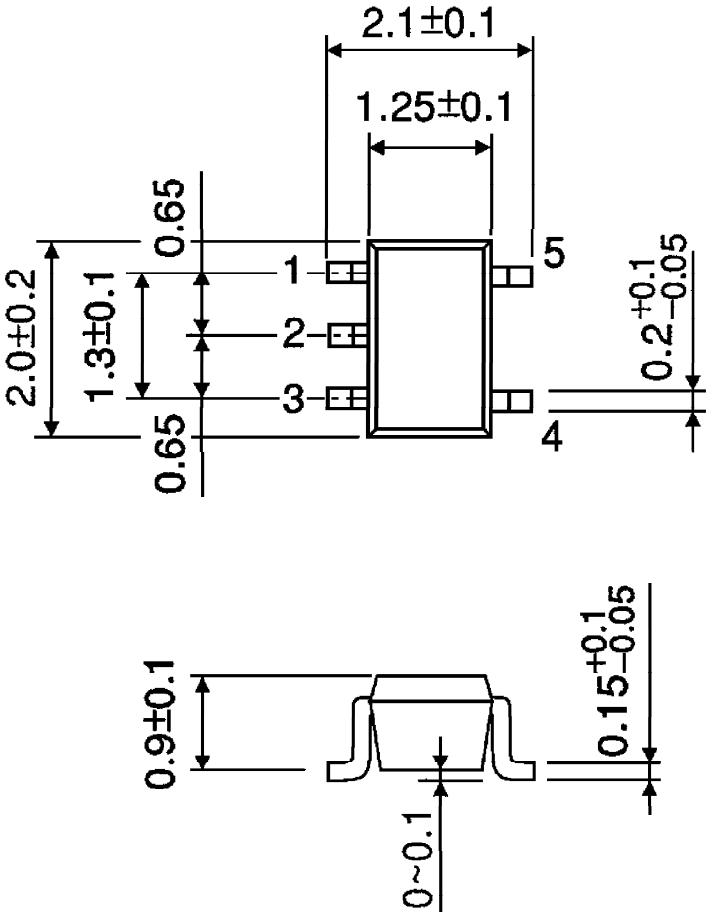
Unit : mm



Weight : 0.016g (Typ.)

OUTLINE DRAWING
SSOP5-P-0.65A

Unit : mm



Weight : 0.006g (Typ.)